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Effects of Chinese Outward FDI**

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# Estimating the Ex-ante and the Ex-post Effects of Chinese Outward FDI

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## Highlights

- We study the relationship between outward FDI and performance of Chinese firms
- By means of firm-level data, we document the ex-ante and ex-post effects of outward FDI
- We show the best performing Chinese firms self-select into outward FDI
- Controlling for endogeneity by PSM, we detect learning effects from outward FDI
- Learning effects are more pronounced when investing in closer regions

## Abstract

This study investigates the relationship between outward Foreign Direct Investment (FDI) and the performance of Chinese enterprises. Using firm-level panel data over the period 2008–2014, we introduce a taxonomy of outward FDI that accounts for the decision to invest abroad and the location of foreign affiliates. Through different specifications, we show systematic differences in performance between FDI starters and non-starters two years before and two years after the first investment by the starters. This fact points to the existence of strong ex-ante and ex-post effects of Chinese outward FDI. On one hand, we provide evidence—so far not present in the literature—that the best performing Chinese firms self-select into outward FDI. On the other hand, controlling for endogeneity through propensity score matching (PSM) techniques, we detect significant learning effects from outward FDI to firm-level performance. Interestingly, these effects are heterogeneous with respect to destination, with deeper learning for Chinese enterprises investing in Asia.

**Keywords:** FDI; China; ex-ante effects; ex-post effects; panel data

**JEL:** F23, L25, O53

## 1. Introduction

In 2019, China was the third largest foreign investor in the world. Outward Foreign Direct Investment (FDI)<sup>1</sup> flows from China accounted for 8.9% of the worldwide total, up from 0.6% in 1995 (UNCTAD 2020). Fast growing outward FDI flows increased Chinese outward FDI stocks from 0.4% of the worldwide total in 1995 to 6.1% in 2019 (UNCTAD 2020). Because of these impressive figures, the outstanding growth rate experienced by Chinese outward FDI has become a cause of concern among Chinese authorities, who are wary of the quality and payoffs of the Chinese investments abroad (UNCTAD 2018, 2019).<sup>2</sup> In this study, we investigate the relationship between the decision to engage in outward FDI by Chinese enterprises and their performance.<sup>3</sup>

Following in the steps of Bernard and Jensen (1995), a large body of evidence has been collected and a wide consensus formed that internationalized firms are in the minority, but they perform better than domestic enterprises. A lively debate has developed instead about the causal interpretation of the positive correlation between internationalization and performance at the firm level.

Serving foreign markets may entail fixed costs in addition to those incurred in the domestic market. Under these circumstances, only the most productive firms—able to command a large market share—can successfully enter foreign markets via exports or outward FDI. It follows that a positive correlation between internationalization and performance emerges as a consequence of differences in performance between internationalized firms and firms operating exclusively in domestic markets that pre-date the decision of the former to serve foreign markets. In this study, we refer to such differences as the ex-ante effects of outward FDI.

Alternatively, firms operating in international markets may have opportunities for knowledge acquisition and capability development unavailable to firms that exclusively operate in domestic markets. If this is the case, a positive correlation between internationalization and performance is observed because of differences in performance between internationalized and domestic firms arising subsequent to the decision of the former to serve foreign markets. In this study, we refer to such differences as the ex-post effects of outward FDI.

The joint study of ex-ante and ex-post effects of outward FDI is of particular relevance in the context of the Chinese economy, to enlighten some implications of the policy measures adopted to promote internationalization and economic growth. Most measures implemented from the early 1980s aimed at fostering economic growth through internationalization, in the spirit of the previously defined ex-

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<sup>1</sup> Consistent with IMF/OECD definitions, we define FDI as an investment in a foreign company where the investor owns at least 10 percent of the ordinary shares, and which is undertaken with the objective of establishing a lasting interest in the country, a long-term relationship, and significant influence on the firm's management (IMF 1993, OECD 1996).

<sup>2</sup> See Section 2 for a discussion of the regulatory framework governing Chinese outward FDI and the policy measures recently adopted by authorities.

<sup>3</sup> By China, we refer to mainland China; Hong Kong is not included in our data.

post effects of outward FDI. However, the recent launch of supply-side structural reforms, meant to improve firm-level productivity, seems to pursue internationalization through economic growth, in the spirit of the ex-ante effects of outward FDI.

Using firm-level panel data over the period 2008–2014, we are able to assess rigorously the presence of ex-ante and ex-post effects of outward FDI for Chinese firms. Our econometric analysis exploits firm-level information downloaded from Orbis, a commercial database compiled by Bureau van Dijk. A distinctive feature of the Orbis database is that it contains a wide array of performance measures as well as the number and location of subsidiaries for firms that invest abroad. Using these data, we introduce a taxonomy of outward FDI that accounts for the decision to invest abroad and the location of foreign affiliates.<sup>4</sup> The panel nature of the data allows us to observe a firm's performance before and after its first investment abroad and thus to disentangle the ex-ante and ex-post effects of outward FDI. Moreover, the Orbis data on FDI by destination make it possible to assess whether ex-ante and ex-post effects of outward FDI are heterogeneous with respect to destination.

Our empirical approach thus allows us to offer a number of novel contributions to the empirical literature on the relationship between outward FDI and firm-level performance and to highlight the implications of outward FDI on performance for Chinese enterprises. In the following, we briefly summarize our results.

Our analysis confirms a positive correlation between outward FDI and several performance measures at the firm level for Chinese enterprises. This holds true when considering Asia and the rest of the world as separate destinations for Chinese outward FDI. Moreover, the magnitude of the correlation appears to be sensitive to location of Chinese subsidiaries. This result is original to our study and is made possible by our classification of outward FDI by destination.

Furthermore, we highlight significant differences in performance between future outward FDI starters and future non-starters, revealing that Chinese firms self-select into investing abroad, even if they do not appear to self-select into specific destinations. To the best of our knowledge, ours is the first study to present rigorous evidence on the ex-ante effects of outward FDI for Chinese enterprises.

Finally, turning to the ex-post effects of outward FDI, after controlling for endogeneity through propensity score matching techniques, our results show significant ex-post effects that tend to be larger when investments are targeted to closer regions. Our contribution to the existing literature is twofold. We consider a time span that is longer and more recent than previous contributions (Huang and Zhang 2017; Cozza et al. 2015; Chen and Tang 2014; Edamura et al. 2014). In particular, our data allows us to study the ex-post effects of outward FDI in the years following the adoption of the 12th Five Year Plan in 2010, which involved a major overhaul of Chinese inward and outward FDI

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<sup>4</sup> Note that we use 'subsidiaries' and 'affiliates' synonymously.

policies. In addition, we investigate whether the ex-post effects of outward FDI are heterogeneous by destination, as our dataset allows us to estimate the ex-post effects of the first investment in Asia and in the rest of the world.

The remainder of the paper is organized as follows. Section 2 provides an overview of outward FDI from China and the regulatory framework governing it. Section 3 reviews the existing literature on the relationship between FDI and performance at the firm level. In Section 4, we present our data, while Section 5 describes the variables and econometric specifications adopted for our empirical purposes. Section 6 illustrates our main results. Section 7 concludes and derives some policy implications.

## **2. Chinese outward FDI: Evolution and regulatory framework**

The last twenty years have witnessed China's development as an important source of outward FDI. In 1995, the country contributed 0.6% of worldwide outward FDI flows. In 2019, China's share of worldwide outward FDI flows amounted to 8.9%, making it the third largest investor in the world. In the same period, China's share of worldwide outward FDI stocks increased from 0.4% to 6.1%. China's share in worldwide outward FDI flows has closed the gap with the country's share in worldwide inward FDI flows, which equalled 9.2% in 2019. The same holds true for FDI stocks, with China contributing 4.9% of worldwide inward FDI stocks in 2019 (UNCTAD 2020).

The growing importance of China as a source and not only a recipient of FDI reflects the striking pace of expansion of outward FDI flows and stocks from the country.

[Insert Table 1]

The outstanding gross domestic product annual growth rates experienced by China over the last two decades account for its success as a source of outward FDI flows and stocks (Andreff 2015). This is consistent with China moving along the investment development path (IDP) identified in Dunning (1981) and Dunning and Narula (1998). In the first steps along the IDP, a developing country attracts a limited number of foreign investors and does not invest abroad. As the country progresses along the IDP, inward FDI sharply increases; at the same time, the country undertakes its first investments abroad. Further along the IDP, the combination of low unit labour cost and technological competence acquired through inward FDI fosters both inward and outward FDI flows. The latter growing faster than the former eventually turns the developing country from a net FDI importer into a net FDI exporter. Full economic development leads to a rebalance of inward and outward FDI flows.

Albeit convincing, this picture leaves in the shadow a distinctive feature of Chinese outward FDI: its careful management by the central government and local authorities. According to Sauvart and Chen (2014), a well-defined regulatory framework governs Chinese outward FDI, whereas continuously

adjusted home-country measures stir its course. The adoption of a well-defined regulatory framework dates back to the launch of the ‘Go out’ strategy in 2000. The aim of this strategy was to promote the internationalization of Chinese firms on the eve of China’s access to the WTO in 2001. In the following years, the government shaped the framework governing outward FDI to promote those investments abroad that specifically contributed to China’s development (Sauvant and Nolan 2015). Increasing labour costs, weak external demand, and signs of declining return on investment (Wei et al. 2017), together with the availability of large foreign exchange reserves (Garcia-Herrero et al. 2015), favoured regulatory liberalization in 2007–2009. The adoption of the 12th Five Year Plan in 2010 imparted further acceleration, at the same time favouring a change of target for Chinese outward FDI. In the early stages of the ‘Go out’ strategy implementation, natural resource-seeking projects attracted most outward FDI flows. Starting in 2010, resources were successfully channelled towards projects pursuing acquisition of advanced technology and high-quality brands (The Economist 2013, 2015) as well as entry into large markets or markets with high development potential (The Economist Intelligence Unit 2017). The adopted measures achieved the goal set in the 12th Plan of balancing outward and inward flows within 5–10 years well in advance of the deadline (Davies 2013).

In essence, the regulatory framework governing Chinese outward FDI works on the principle that interventions and home country measures must be designed with the aim of encouraging, allowing, or prohibiting investments (Sauvant and Chen 2014). An instance of the latter materialized recently. In 2016, China’s outward FDI flows peaked at 196 billion USD, accounting for more than 12% of worldwide outward FDI flows. This spurred concerns among Chinese authorities regarding excessive capital outflows and poor selection of investment projects. In response to that, restrictions were imposed on state-owned enterprise investments abroad in specific sectors such as property development, hotels, and entertainment (UNCTAD 2018, 2019). On the other hand, China actively pursues promoting outward FDI by entering into international investment agreements and bilateral treaties. The Belt and Road Initiative is a prominent example of the former, involving 68 countries and committing China to underwriting important infrastructure investments in the regions crossed by the ancient Silk Road linking Asia to Europe. Bilateral investment treaties not only provide protection to Chinese investors abroad; they also help overcome the strategic concerns and oppositions Chinese multinationals face in advanced countries because of the State backing they often have (Dollar 2017, Sauvant 2016).

### 3. Literature review

Starting with the seminal contribution of Bernard and Jensen (1995), a vast body of literature has investigated the relationship between internationalization and performance at the firm level. No matter the year and country of the analysis, empirical evidence suggests that internationalized firms are in the minority, but they outperform domestic enterprises, and this result is robust to different internationalization strategies and performance measures.<sup>5</sup>

For the purpose of the present research, it is particularly interesting to review those papers studying the relationship between outward FDI and performance at the firm level. For the sake of clarity, we group them in three classes: those providing some basic correlations (3.1), and those addressing the ex-ante (3.2) and ex-post effects of outward FDI (3.3).

#### 3.1 Basic correlations

Broad empirical evidence supports the existence of a positive and statistically significant relationship between outward FDI and performance at the firm level. In Castellani and Zanfei (2007), Castellani and Giovannetti (2010), Benfratello and Razzolini (2009), Bugamelli et al. (2000, 2001), Casaburi et al. (2007), and Borin and Mancini (2016), Italian firms with at least one subsidiary abroad are shown to outperform exporters and domestic enterprises on a number of measures. These include economic variables, such as size (Casaburi et al. 2007; Bugamelli et al. 2000, 2001; Borin and Mancini 2016), productivity (Benfratello and Razzolini 2009; Castellani and Giovannetti 2010; Borin and Mancini 2016), and capital intensity (Casaburi et al. 2007; Borin and Mancini 2016); and innovation variables, such as patents, product innovation, and process innovation (Castellani and Zanfei 2007). Complementary evidence from single-country analyses is available for Germany (Wagner 2006; Arnold and Hussinger 2010), France (Engel and Procher 2012), Japan (Kimura and Kiyota 2006; Head and Ries 2003), the UK (Girma 2005), Ireland (Girma et al. 2004) and the US (Helpman et al. 2004). Multiple-country studies on the EU (Gattai and Sali 2018), the BRIC (Gattai and Natale 2016; Gattai et al. 2018) and the former Soviet states (Gattai et al. 2019) confirm that firms engaged in outward FDI are in the minority, but outperform those that only operate domestically.

To establish some basic correlations between outward FDI and firm-level performance, the studies mentioned simply regress economic and innovation variables on a dummy for outward FDI status or vice versa. In some cases, the regressand and the regressors are contemporaneous variables (see, for instance, Castellani and Zanfei 2007; Casaburi et al. 2007; Kimura and Kiyota 2006; Benfratello and Razzolini 2009); in others, some lags are considered to avoid complete simultaneity (Gattai and Sali

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<sup>5</sup> For a survey, see Lopez (2005), Wagner (2007, 2012, 2016), Greenaway and Kneller (2007), Singh (2010), and Hayakawa et al. (2012).

2018). Although the majority of the studies reviewed in this sub-section employ cross-sectional information, a few of them rely on panel data (Girma 2005; Castellani and Zanfei 2007; Kimura and Kiyota 2006; Arnold and Hussinger 2010; Castellani and Giovannetti 2010). However, causality issues are not addressed econometrically, which is the major drawback of this line of research.

### 3.2 Ex-ante effects

Studying the ex-ante effects of outward FDI means imparting a certain direction of causality to the relationship between outward FDI and firm-level performance. If ex-ante effects are at play, the best firms are expected to self-select and become involved in outward FDI. Put another way, the existence of ex-ante effects is consistent with causality running from performance to outward FDI.

The theoretical foundation of the self-selection mechanism can be traced back to Helpman et al. (2004), Head and Ries (2003), and Grossman et al. (2006) who extend the benchmark framework of Melitz (2003) to analyse the intra-industry effects of horizontal (Helpman et al. 2004), vertical (Head and Ries 2003) and mixed (Grossman et al. 2006) FDI.<sup>6,7</sup> In Helpman et al. (2004), upon entry into the market, firms draw a productivity level from a known distribution. Operating abroad entails considerable fixed costs related to transportation, marketing, human capital, and production. These costs are higher in the case of outward FDI and lower in the case of export. As the model predicts, exposure to international markets induces the most productive firms to engage in outward FDI and the least productive firms to operate domestically. Firms with intermediate productivity levels self-select into export operations. Head and Ries (2003) consider a richer framework in which firms are allowed to engage in both horizontal and vertical FDI. Horizontal FDI is motivated by market access considerations, that is, potential gains from producing directly in the host market rather than producing at home and exporting abroad. Vertical FDI is motivated by cost saving considerations, that is, potential gains from splitting the production process across many phases and letting each phase be performed in the country where it is least expensive. As Head and Ries (2003) show, the most productive firms engage in outward FDI in advanced countries to serve local demand directly, whereas the least productive firms set subsidiaries in emerging economies to reduce labour costs. Given that firms may follow mixed strategies, Grossman et al. (2006) allow firms to offshore single stages of production to multiple countries, depending on both market access and cost saving considerations. Many factors, such as the foreign market dimension, transportation costs, and fixed costs of production and assembly, crucially determine which strategy a firm should undertake, thus complicating the relationship between outward FDI and firm-level performance.

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<sup>6</sup> Mixed FDI refers to a combination of horizontal and vertical outward FDI.

<sup>7</sup> For a survey, see Redding (2011).



The hypothesis of self-selection has been tested quite convincingly in the case of trade, whereas outward FDI has received less attention so far. Consistent with the theoretical framework delineated above, Murakami (2005), Kimura and Kiyota (2006), Barba Navaretti and Castellani (2004), Barba Navaretti et al. (2010), and Borin and Mancini (2016) detect a positive and statistically significant effect of firm performance on outward FDI. To this aim, they employ panel data and regress past performance on a dummy for future FDI starters. This methodology allows studying performance differentials between firms engaged versus not engaged in outward FDI before first involvement in FDI by the former. As explained in Wagner (2007), this is a proper econometric approach to deal with endogeneity and provide conclusive evidence on the ex-ante effects of internationalization. Refinements of these simple analyses follow two broad research trajectories. On one hand, Tomiura (2007), Federico (2010), and Kohler and Smolka (2011, 2012) analyse heterogeneous firms' mapping into different sourcing strategies, including outward FDI. Along the theoretical argument of Antras and Helpman (2004, 2008), these papers show that most productive firms self-select into outward FDI; in other words, they choose to source intermediate components within the boundaries of a foreign subsidiary. On the other hand, outward FDI is dissected according to the destination and the ownership structure. Regarding destination, Aw and Lee (2008) and Damijan et al. (2007) find that the most productive firms invest in developed—rather than developing—countries, supporting the theoretical predictions of Grossman et al. (2006). On ownership structure, the theoretical and empirical analysis of Raff et al. (2012) suggests that the most productive firms engage in wholly foreign-owned enterprises, followed by joint ventures and mergers and acquisitions.

### **3.3. Ex-post effects**

Studying the ex-post effects of outward FDI means considering the opposite direction of causality, from outward FDI to firm-level performance. If ex-post effects are at play, those firms that are involved in outward FDI are expected to perform better than those firms that are not. Put another way, ex-post differences in performance might be channelled by a learning process that allows firms to take advantage of their FDI experience.

Compared with the self-selection mechanism delineated in sub-section 3.2, this learning process has less profound theoretical foundations. Indeed, the model by Clerides et al. (1998), which is a cornerstone in the learning-by-internationalization literature, deals uniquely with export and has not yet been extended to outward FDI. Another model, from Grossman and Rossi-Hansberg (2008), shows that global supply chains emerge depending on firms' optimal strategies. This is because offshoring a task frees up some resources that could be profitably employed in other tasks, thus increasing overall efficiency. Exogenous reductions in the costs of offshoring might fuel this process

further, producing larger efficiency gains. This might explain differences in performance between firms that are involved in outward FDI and firms that are not if one thinks the former have benefited from decreasing coordination costs due to innovation and information and communications technologies (ICT).

Despite the absence of an ad-hoc theoretical framework, one could imagine several factors explaining a learning-by-FDI mechanism. For instance, through interaction with foreign competitors and customers, firms derive information about processes to reduce cost and improve quality (De Loecker 2007), they increase their scale and become more efficient (Baldwin and Gu 2009), and they are strongly encouraged to innovate (Aw and Lee 2008). Moreover, operating abroad can be regarded as a substitute for importing (access to) better institutions, thus correcting for credit constraints and a weak institutional environment in the home country (Van Biesebroeck 2005). For all these reasons, firms involved in outward FDI are expected to improve more quickly than their domestic counterparts.

Papers investigating the learning effects of outward FDI focus on a limited group of countries. These include Italy (Barba Navaretti and Castellani 2008; Castellani 2002; Castellani et al. 2008; Borin and Mancini 2016); France (Hijzen et al. 2011; Barba Navaretti et al. 2010); Japan (Hijzen et al. 2010; Ito 2007); Taiwan (Yang et al. 2013); and China (Huang and Zhang 2017). To estimate the ex-post effects of outward FDI, these studies make use of panel data and regress future performance on a dummy for past FDI starters. To control for endogeneity, sophisticated econometric techniques are applied, such as GMM/IV (Castellani 2002; Castellani et al. 2008) and propensity score matching estimations (Barba Navaretti and Castellani 2008; Barba Navaretti et al. 2010; Hijzen et al. 2010, 2011; Ito 2007; Yang et al. 2013; Borin and Mancini 2016; Huang and Zhang 2017). As explained in Wagner (2007), these are proper econometric approaches for providing conclusive evidence on the ex-post effects of internationalization. However, evidence of a learning effect from outward FDI is still controversial. Although Barba Navaretti et al. (2010), Barba Navaretti and Castellani (2008), Castellani et al. (2008), Borin and Mancini (2016), Yang et al. (2013), and Huang and Zhang (2017) find outward FDI has a positive impact on many performance variables, Hijzen et al. (2010, 2011), and Ito (2007) do not detect any significant ex-post effect.

#### 4. Data

Our econometric analysis exploits firm-level information downloaded from Orbis, a commercial dataset compiled by Bureau van Dijk that contains administrative data on 300 million firms around the globe.<sup>8</sup> We believe that Orbis is an appropriate database for obtaining data to estimate the ex-ante and ex-post effects of Chinese outward FDI for several reasons.<sup>9</sup> Unlike other administrative firm-level databases, Orbis covers small and large firms, public and private firms, and all sectors of the economy, which is important to allow for firm- and industry-level heterogeneity. Furthermore, Orbis reports information regarding the firm ownership type and structure, including the list of subsidiaries, which is key for defining outward FDI.<sup>10</sup> Lastly, Orbis data have a longitudinal nature. Some information is available for download only for the previous year; however, older records can be retrieved from Bureau van Dijk under special research agreements, which allows working with panel data.

For the purpose of the present research, we make use of a balanced panel of Chinese enterprises. Our sample covers the whole set of 747 listed industrial companies, that are headquartered in mainland China continuously over the period 2008–2014.<sup>11</sup> Industrial companies are selected from a long list of company types<sup>12</sup> to study the behaviour of heterogeneous firms within a relatively homogeneous class, still covering all NACE 2-digit industries. Although Orbis collects information on both listed and unlisted companies, attention is restricted to the former because listed firms are surveyed in a more detailed format, which is more appropriate for our goals. From a geographical point of view, we focus on mainland China and do not consider companies headquartered in Hong Kong. A vast literature in International Business argues that multinational companies from developing and developed countries have different characteristics and behave differently (Deng 2013; Ramamurti 2012). Mainland China is a developing country, whereas Hong Kong can be considered an advanced economy. For this reason, we do not consider companies headquartered in the latter.

From an industrial point of view, our sample is skewed towards manufacturing firms, which account for 68% on average over the 6-year period of interest. Wholesale and retail trade, ICT, and constructions are also well represented, amounting to 14%, 5.1%, and 3.4%, respectively. Smaller

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<sup>8</sup> For more details, see Ribeiro et al. (2010).

<sup>9</sup> For a comprehensive analysis of the pros and cons of the Orbis data, see Kalelmi-Ozcan et al. (2015).

<sup>10</sup> At this stage, it is worth mentioning that Orbis allows us to employ data on the actual outward FDI rather than announced deals (Amighini et al. 2013; Edamura et al. 2014) or approved transactions (Chen and Tang 2014).

<sup>11</sup> We are aware that our sample is not representative of the population of Chinese firms. Nevertheless, as we show below our descriptive evidence is consistent with the literature on Chinese firms investing abroad. In addition, in our econometric analysis, we control for biases due to the potential overrepresentation in our sample of firms by size, industry, age and headquarter location.

<sup>12</sup> Including banks, insurance companies, financial companies, private equity funds, venture capital, hedge funds, mutual and pension funds, foundation and research institutes, and public authorities.

shares accrue to professional, scientific, and technical activities (2.6%) and agriculture, forestry and fishing (2.1%).

From a geographical point of view, most of our firms are headquartered in Beijing (20%), Guangdong (11%), Jiangsu (13%), Shandong (6%), Anhui (5%) and Fujian (4.5%). Hubei, Hunan and Shanghai are important as well, accounting for 3% each on average. Smaller shares accrue to the other provinces included in our database.

From an ownership point of view, state-owned firms are in the majority (76%).<sup>13</sup> State-owned firms are credited with being more likely to invest abroad for a number of reasons (Amighini et al. 2013). These range from easy access to financial resources (Sutherland and Ning 2011) to responding to national interests (Song et al. 2011). In light of these considerations, we control for the ownership type in all our estimates.

Figure 1 summarizes the involvement in outward FDI by the Chinese firms in our sample. The richness of Orbis data on firm ownership structure allows us to define different types of involvement in outward FDI. On one hand, we consider firms with at least one subsidiary abroad in a certain year (*FDI firms*); on the other hand, we distinguish between firms having at least one subsidiary in Asia (*FDI\_ASIA firms*) and firms having at least one subsidiary in the rest of the world (*FDI\_ROW firms*) over the same year. It is worth mentioning that we do not classify as outward FDI subsidiaries located in Hong Kong. There is consolidated evidence that Hong Kong is just a stopover location for Chinese outward FDI directed to other destinations (UNCTAD 2001). In addition, large shares of Chinese capital invested in Hong Kong are channelled back to China as inward FDI, with the aim of enjoying the preferential treatments reserved for foreign investors (Garcia-Herrero et al. 2015; UNCTAD 2001). As we are unable to identify the final destinations of Chinese outward FDI to Hong Kong and round-tripping FDI would distort our results, we exclude outward FDI to Hong Kong from our analysis.

As our most notable finding, involvement in outward FDI by Chinese firms is rather scant. In fact, starting with 51 *FDI firms* in 2008, we reach the modest peak of 129 in 2014. Nonetheless, involvement in outward FDI has been steadily increasing over the 6-year period of interest. According to our data, the percentage of Chinese enterprises having at least one subsidiary abroad was close to 7% in the years 2008-11, increased to 13% in 2012, and reached 17% in 2014, with an average value of 11% over the entire period.<sup>14</sup> Consistent with Chen and Tang (2014), the average share of private firms having at least one subsidiary abroad is 12.5%, above the 10.25% average share of state-owned firms investing abroad. Besides following the evolution of *FDI firms* over time, it is interesting to

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<sup>13</sup> This is not a peculiar feature of our sample. See Ramasamy et al. (2012).

<sup>14</sup> Note that these data are consistent with the information on aggregate outward FDI flows discussed in Section 2 and reported in Table 1.

consider *FDI\_ASIA firms* and *FDI\_ROW firms* to appreciate the potential differences in involvement by destination of outward FDI.

Physical and cultural distance increase management costs and thus reduce the attractiveness of investing abroad (Kolstad and Wiig 2012; Quer et al. 2012). At the same time, culturally distant destinations may offer access to strategic resources as well as social and organizational models that foster firm performance (Quer et al. 2012). To capture both physical and cultural distance, we distinguish between Asian and non-Asian destinations. A third of Asian countries share a border with China. In addition, several Asian countries host native Chinese communities, a feature facilitating communications and integration for Chinese investing firms.<sup>15</sup> Unfortunately, data limitations prevent us from adopting finer destination categories.

Our evidence reported in Figure 1 suggests that the group of *FDI\_ASIA firms* is systematically smaller than the group of *FDI\_ROW firms*. Put another way, within the subsample of *FDI firms*, Chinese enterprises tend to open subsidiaries in rest of the world rather than in Asia. The share of *FDI\_ROW firms* in *FDI firms* is 81% on average between 2008 and 2014. The share of *FDI\_ASIA firms* is remarkably lower, with an average value of 43%.<sup>16</sup> Empirical evidence suggests that state-owned firms tend to invest in distant regions (Amighini et al. 2013; Ramasamy et al. 2012). One could argue that the prevalence of state-owned firms in our sample might drive the large share of *FDI firms* investing in the rest of the world. However, this is not the case because a consistent distribution of destinations characterizes FDI by state-owned and private firms in our sample.

[Insert Figure 1]

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<sup>15</sup> The presence of native Chinese communities is used in the literature as a proxy for cultural distance (Quer et al. 2012).

<sup>16</sup> The share of *FDI firms* investing in both regions is less than 10% in 2008 and takes an average value of 27% in the following years. Due to the limited number of *FDI firms* in our data, we consider mutually inclusive categories of outward FDI by destination in our empirical analysis. The small share of *FDI firms* investing in both Asia and the rest of the world suggests the opportunity of doing so.

## 5. Variables and specifications

Having described our data, in this section we introduce the variables and specifications employed for econometric purposes. First, we establish some basic correlations between involvement in outward FDI and performance of Chinese firms (5.1). Second, we introduce our empirical methodology to estimate the ex-ante (5.2) and ex-post effects (5.3) of Chinese outward FDI. Taking advantage of the longitudinal nature of our data, particular attention is devoted to causality issues.

### 5.1 Basic correlations

A first look at our data suggests estimating Equation 1 to establish some basic correlations between involvement in outward FDI and performance of Chinese enterprises:

$$\ln P_{it} = a + b du\_FDI_{it} + c C_{it} + \varepsilon_{it} \quad (1)$$

The dependent variable  $P_{it}$  denotes the performance of firm  $i$  in year  $t$ . For the purpose of this research, we consider several performance variables, including sales (*sales*), profit (*profit*), labour productivity (*lp*) and intangible assets (*ia*). In selecting these variables, we capture different aspects of firm performance. Sales, profit and labour productivity are purely economic variables that proxy for firm efficiency, whereas intangible assets primarily relate to firm innovation capacity and thus account for firm innovative strength.<sup>17</sup>

On the right-hand side of Equation 1,  $du\_FDI_{it}$  is a dummy equal to 1 if firm  $i$  has at least one subsidiary abroad in year  $t$ , and 0 otherwise. Clearly,  $du\_FDI_{it}$  equals 1 for the *FDI firms* introduced in Section 4. The literature review presented in Section 3 suggests that the coefficient of  $du\_FDI_{it}$  should be positive and statistically significant, meaning that there is a positive correlation between involvement in outward FDI and performance of Chinese enterprises. Put another way, we expect *FDI firms* to outperform non-*FDI firms*.

Adding to  $du\_FDI_{it}$ ,  $C_{it}$  is a matrix of control variables that we include in every specification to account for firm, industry, and space heterogeneity. At the firm level, we control for firm age (*age*), size (*large*), and type of ownership (*public*). At the industry level, we consider NACE-2 digit industry dummies, whereas province dummies account for space heterogeneity. Time fixed effects are included by means of year dummies.

To delve more deeply into establishing some basic correlations, we estimate Equation 2:

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<sup>17</sup> Our selection of performance variables is in line with the literature on outward FDI and performance. See Borin and Mancini (2016), Chen and Tang (2014), Edamura et al. (2014), Cozzi et al. (2015) to mention a few.

$$\ln P_{it} = a + b_1 du\_FDI\_ASIA_{it} + b_2 du\_FDI\_ROW_{it} + cC_{it} + \varepsilon_{it} \quad (2)$$

The only difference between Equations 1 and 2 lays in our measure of involvement in outward FDI, which is  $du\_FDI_{it}$  in the former case and both  $du\_FDI\_ASIA_{it}$  and  $du\_FDI\_ROW_{it}$  in the latter case.  $du\_FDI\_ASIA_{it}$  ( $du\_FDI\_ROW_{it}$ ) is a dummy equal to 1 if firm  $i$  has at least one subsidiary in Asia (the rest of the world) in year  $t$ , and 0 if the firm has no subsidiary abroad. Clearly,  $du\_FDI\_ASIA_{it}$  ( $du\_FDI\_ROW_{it}$ ) equals 1 for the *FDI\_ASIA firms* (*FDI\_ROW firms*) introduced in Section 4. The reason for dissecting outward FDI by destination is that the expected positive correlation between involvement in outward FDI and firm-level performance might differ in magnitude when allowing for heterogeneous destinations. However, which coefficient should be greater is not obvious because, to the best of our knowledge, our classification cuts across previously adopted taxonomies of destinations (see, for instance, Amighini et al. 2013; Chen and Tang 2014; Casaburi et al. 2007; Gattai et al. 2018).

Table 2 includes a full description of the variables employed for econometric purposes.

[Insert Table 2]

## 5.2 Ex-ante effects

Having studied some basic correlations, we now introduce our empirical methodology to investigate the ex-ante effects of Chinese outward FDI. Consistent with the literature reviewed in Section 3, we test the self-selection hypothesis by allowing causality to run from performance to outward FDI. If the best performing firms become outward investors, then we should expect to observe significant differences in performance between future outward FDI starters and future non-starters a few years before the former begin to invest abroad. To test whether today's outward FDI starters were better performers than today's non-investors in the past, when none of them was engaged in outward FDI, we proceed as follows. First, we restrict attention to those firms that were not engaged in outward FDI in 2008, the first year in our panel. Using this approach, we intend to consider only firms that could potentially become outward FDI starters (*starters*) during the period of interest and compare them with those that will never engage in outward FDI (*non-starters*).<sup>18</sup> Second, we investigate the average difference in performance in year  $t-2$  between firms that are *starters* and *non-starters* in year  $t$ .<sup>19</sup> More formally, we estimate Equation 3:

<sup>18</sup> To this aim, we accept a reduction to 696 in the number of firms in our panel.

<sup>19</sup> Given the time dimension of our panel, the two-year lag is chosen to preserve a reasonable interval between the year in which performance is evaluated and the year in which some firms became *starters*, without sacrificing too many of the potential *starters*.

$$\ln P_{it-2} = a + b du\_START\_FDI_{it} + c C_{it-2} + \varepsilon_{it-2} \quad (3)$$

In Equation 3, the dependent variable  $P_{it-2}$  denotes the performance of firm  $i$  in year  $t-2$  and it is measured in terms of sales, profit, labour productivity and intangible assets, as in Equations 1 and 2. On the right-hand side of Equation 3,  $du\_START\_FDI_{it}$  is a dummy equal to 1 if firm  $i$  becomes a *starter* in year  $t$ , and 0 if it remains a *non-starter*. More precisely, considering a two-year lag,  $du\_START\_FDI_{it}$  equals 1 if firm  $i$  had no subsidiary abroad in years  $t-2$  and  $t-1$  and has at least one in year  $t$ ; it equals 0 if firm  $i$  has no subsidiary abroad in years  $t-2$ ,  $t-1$ , and  $t$ .

The literature review in Section 3 suggests that the coefficient of  $du\_START\_FDI_{it}$  should be positive and statistically significant, meaning that the best performing firms self-select into outward FDI. Put another way, we expect outward FDI *starters* to outperform *non-starters* a couple of years before the former engage in outward FDI. Adding to  $du\_START\_FDI_{it}$ ,  $C_{it}$  is the same matrix of control variables we considered in Equations 1 and 2.

To shed more light on the ex-ante effects of Chinese outward FDI, we further estimate Equation 4, in which involvement in outward FDI is measured by the two dummies  $du\_START\_FDI\_ASIA_{it}$  and  $du\_START\_FDI\_ROW_{it}$ :

$$\ln P_{it-2} = a + b_1 du\_START\_FDI\_ASIA_{it} + b_2 du\_START\_FDI\_ROW_{it} + c C_{it-2} + \varepsilon_{it-2} \quad (4)$$

$du\_START\_FDI\_ASIA_{it}$  is a dummy equal to 1 if firm  $i$  becomes a *starter* in Asia in year  $t$ , and 0 if it remains a *non-starter*. More precisely, considering a two-year lag,  $du\_START\_FDI\_ASIA_{it}$  equals 1 if firm  $i$  had no subsidiary abroad in years  $t-2$  and  $t-1$  and has at least one in Asia in year  $t$ ; it equals 0 if firm  $i$  has no subsidiary abroad in the years  $t-2$ ,  $t-1$ , and  $t$ . Similarly,  $du\_START\_FDI\_ROW_{it}$  is a dummy equal to 1 if firm  $i$  becomes a *starter* in the rest of the world in year  $t$ , and 0 if it remains a *non-starter*. Considering the usual two-year lag,  $du\_START\_FDI\_ROW_{it}$  equals 1 if firm  $i$  had no subsidiary abroad in years  $t-2$  and  $t-1$  and has at least one in the rest of the world in year  $t$ ; it equals 0 if firm  $i$  has no subsidiary abroad in years  $t-2$ ,  $t-1$ , and  $t$ .

The reason for dissecting outward FDI by destination is to disentangle potential differences in the ex-ante effects by host country. However, which coefficient should be larger remains an open issue because our classification cuts across the previously adopted taxonomies of destinations (see, for instance, Aw and Lee 2008; Damijan et al. 2007; Borin and Mancini 2016).



### 5.3 Ex-post effects

In this sub-section, we introduce the empirical methodology we use to study the ex-post effects of Chinese outward FDI. Consistent with previous contributions on the learning-by-internationalization hypothesis,<sup>20</sup> we allow causality to run from outward FDI to performance. If outward investors become the best performing firms, then we should expect to find significant differences in performance between past outward FDI starters and past non-starters a few years after the former began to invest abroad. To test whether yesterday's outward FDI starters will be better performers in the future than yesterday's non-investors, we proceed as follows. First, we restrict attention to those firms that were not engaged in outward FDI in 2008, the first year in our panel. Using this approach, we intend to consider only firms that could potentially become outward FDI starters during the period of interest and compare them with those that never engage in outward FDI.<sup>21</sup> Second, we investigate the average difference in performance in year  $t$  between firms that were *starters* and *non-starters* in year  $t-2$ . Lastly, we estimate the average difference in performance in year  $t$  between firms that were *starters* in Asia and the rest of the world and *non-starters* in year  $t-2$ .

More formally, our empirical analysis suggests estimating Equations 5 and Equation 6, where the regressand and the regressors are the same as in sub-section 5.2:

$$\ln P_{it} = a + b du\_START\_FDI_{it-2} + c C_{it} + \varepsilon_{it} \quad (5)$$

$$\ln P_{it} = a + b_1 du\_START\_FDI\_ASIA_{it-2} + b_2 du\_START\_FDI\_ROW_{it-2} + c C_{it} + \varepsilon_{it} \quad (6)$$

Based on the literature reviewed in Section 3, we expect the coefficient of  $du\_START\_FDI_{it-2}$  to be positive and statistically significant, meaning that firm performance is affected by first involvement in outward FDI. The relative magnitude of the coefficient of  $du\_START\_FDI\_ASIA_{it-2}$  and  $du\_START\_FDI\_ROW_{it-2}$  is instead open to investigation, as physical and cultural distance may have opposite effects on firm performance.<sup>22</sup>

However, we acknowledge that Equations 5 and 6 are particularly challenging estimating due to endogeneity issues. Suppose our evidence is that firms starting to invest abroad outperform those that do not engage in outward FDI. This might not point to a causal effect from outward FDI to performance if a self-selection mechanism is at play. In this case, best performing firms self-select into outward FDI and so, if *starters* perform better than *non-starters* tomorrow, this might be the

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<sup>20</sup> See Section 3.

<sup>21</sup> As mentioned above, this entails a reduction to 696 in the number of firms in our panel.

<sup>22</sup> See Section 4.

result of pure self-selection rather than learning. Put another way, *starters* might perform better than *non-starters* tomorrow simply because they were better performers before investing and remained so over time. That is, *starters* will perform better tomorrow even if they do not start outward FDI, meaning that there is no ex-post effect of outward FDI on performance. To deal with reverse causality in a proper way, one would ideally need data for the counterfactual situation to observe whether today's starters would have been better performers than non-starters tomorrow if the former had not started investing abroad. Unfortunately, these data are not available because we cannot follow the same firm under both circumstances: it is either a *starter* or a *non-starter*. To overcome this problem, we adopt the propensity score matching (PSM) procedure as in Barba Navaretti and Castellani (2008), Barba Navaretti et al. (2010), Hijzen et al. (2010, 2011), Ito (2007), Yang et al. (2013), Borin and Mancini (2016), and Huang and Zhang (2017).<sup>23</sup> Roughly speaking, the rationale for this statistical approach can be summarized as follows. Since it is not possible to observe the same firm in the event it becomes a *starter* and in the event it does not, we match each *starter* with firms, which are ex-ante similar to the first one, but did not invest abroad. We then proceed to evaluate the ex-post differences in performance between the former and the latter, which serves as a proxy for the unobservable counterfactual.

To implement the PSM procedure, our first step is to match each *starter* with ex-ante similar *non-starters*. Ex-ante similarity is established by estimating the probability that a firm invests for the first time at  $t$  conditional on firm characteristics as observed at  $t - 1$ , the so-called propensity score. We estimate the propensity score by means of a probit model. The set of variables that capture a firm's characteristics include firm age, number of employees, capital intensity, and industry and province dummies. We proceed to evaluate the ex-post difference in performance between *starters* and the matched *non-starters* by estimating the per-period average treatment effects on treated (ATTs). The latter corresponds to the difference between the average performance of the *treated* firms and the propensity-score weighted average performance of the *control* firms.<sup>24</sup> For the sake of robustness, *starters* and *non-starters* are matched via two alternative matching methods, the kernel matching and the radius matching.

Following Caliendo and Kopeinig (2008), these methods are credited for addressing the matching between treated and control firms in a different way. Kernel matching is a non-parametric matching estimator that uses weighted averages of all firms in the control group to construct the counterfactual outcome, assigning more weights if control observations are closer in terms of propensity score of a

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<sup>23</sup> For a comprehensive discussion of these techniques, see Becker and Ichino (2002), Caliendo and Hujer (2006), Caliendo and Kopeinig (2008), and Imbens and Wooldridge (2009).

<sup>24</sup> For technical details, see Borin and Mancini (2016).

treated firm and lower weights on more distant observations. Under radius matching, instead, firms within a pre-specified propensity score distance (caliper) are chosen as matching partners for the treated firms. This avoids the risk of bad matches thus increasing the matching quality; however, if few matches are performed, the variance of the estimates might increase.<sup>25</sup>

We apply the same approach to the treatments *first investment in Asia* and *first investment in rest of the world*, separately considered. In this way, we intend to assess potential differences in the ex-post effects of outward FDI by destination.

Eventually, we evaluate the quality of matching between our *starters* or *treated* firms and the *non-starters* or *control* firms by testing the so-called balancing hypothesis, that is, whether the observations with the same propensity score have the same distribution of observable characteristics, independent of the treatment.

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<sup>25</sup> In the case of the kernel matching method, to avoid any matching bias and to improve the matching quality, we employ the variant ‘common support’. Results are computed by using a bandwidth of 0.06. In the case of radius matching method, following Piermartini and Rousová (2013), we employ a caliper of 0.001, which is a good compromise for avoiding bad matches and ensuring representative results. For radius matching method, we employ the variants ‘common support’ and ‘without replacement’. The matching procedure is computed with Stata 14.0 using the routine provided by Leuven and Sianesi (2003).

## 6. Results

In this section, we comment on the most important results from our econometric analysis. For the sake of consistency, our findings are organized in three sub-sections, dealing with basic correlations (6.1) and the ex-ante (6.2) and ex-post effects (6.3) of Chinese outward FDI.

### 6.1 Basic correlations

Table 3 displays our OLS estimates of Equation 1.

[Insert Table 3]

As our most notable finding, the coefficient of  $du\_FDI$  is positive and statistically significant. As it is robust to different specifications and a large number of controls at the firm, industry, and space levels, this result helps to establish some basic correlations between involvement in outward FDI and firm-level performance.

According to our estimates, Chinese enterprises with at least one subsidiary abroad tend to be more efficient and more innovative than those with none. This evidence points to the existence of a positive correlation between involvement in outward FDI and firm-level performance, as already documented in Castellani and Zanfei (2007), Girma et al. (2004), Girma (2005), Kimjura and Kiyota (2006), and Gattai and Sali (2018), to mention just a few. Compared with previous research on the same topic, our contribution is providing evidence for a large panel of Chinese enterprises, rather than focusing on advanced economies.

To probe more deeply into establishing some basic correlations, we estimate Equation 2, in which involvement in outward FDI is defined by the destination of investments. Our results are summarized in Table 4.

[Insert Table 4]

Interestingly, the coefficients of  $du\_FDI\_ASIA$  and  $du\_FDI\_ROW$  are positive and statistically significant. This suggests that the positive correlation between involvement in outward FDI and firm-level performance survives when we allow for heterogeneity in the destination of investments, consistent with our priors as derived in sub-section 3.1. Looking at the magnitude of the coefficients, one might push the argument a bit further and ask whether Chinese firms with certain characteristics tend to select one destination or another. From Table 4, we see that the coefficient of  $du\_FDI\_ROW$  is larger than that of  $du\_FDI\_ASIA$  for all the dependent variables. These are completely original results of the present study, which elaborates on a new classification of host countries.

Lastly, it is worth noting that the variable *public*, included in our estimates as a mere control, is significant in most specifications. Moreover, its positive sign is consistent with the literature on the relationship between state-ownership and firm-level performance (Amighini et al. 2013).

## 6.2 Ex-ante effects

Table 5 displays our OLS estimates of Equation 3. Consistent with the theoretical predictions of Helpman et al. (2004), Head and Ries (2003), and Grossman et al. (2006), the coefficient of *du\_START\_FDI* is positive and statistically significant. This result is robust to different measures of performance and a large number of controls at the firm, industry, and space levels, documenting the existence of strong ex-ante effects of outward FDI.

In fact, our estimates report significant differences in performance between future outward FDI *starters* and future *non-starters* a couple of years before the former begin to invest abroad. Thus, a self-selection mechanism is at play, meaning that causality runs from past performance to future involvement in outward FDI: Chinese enterprises with larger sales (*sales*), profit (*profit*), labour productivity (*lp*) and intangible assets (*ia*) in *t-2* do become FDI *starters* in *t*.

[Insert Table 5]

Our evidence reported in Table 5 is consistent with previous studies by Kimura and Kiyota (2006), Barba Navaretti et al. (2010), and Borin and Mancini (2016), to mention just a few. Compared with previous research on the same topic, our contribution is testing the self-selection hypothesis for a large sample of Chinese enterprises. To the best of our knowledge, this is the first study to assess rigorously the ex-ante effects of outward FDI in China.

Table 6 reports the results of our OLS estimates of Equation 4. Interestingly, the coefficients of *du\_START\_FDI\_ASIA* and *du\_START\_FDI\_ROW* remain positive and statistically significant in most specifications. This suggests that Chinese firms self-select to become FDI *starters*. However, when looking at the magnitude of the estimated coefficients, we do not find evidence of self-selection to a specific destination. Partially contrasting results are those of Aw and Lee (2008), Damijan et al. (2007), and Borin and Mancini (2016), who find that the most productive Taiwanese, Slovenian, and Italian firms invest in advanced rather than developing countries. One possible explanation for our contrasting findings is that we consider a geographical classification, rather than one based on the development stage of the host country. Another explanation is our focus on a developing country (China) rather than an advanced country (Taiwan, Slovenia, Italy), in light of the vast literature on the differences between multinationals from emerging countries and those from developed countries.<sup>26</sup>

[Insert Table 6]

Among control variables, the coefficient of *public* is positive and statistically significant in Tables 5 and 6. This suggests that public ownership tends to favour good performance of Chinese enterprises.

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<sup>26</sup> For a survey, see Deng (2013) and Ramamurti (2012).

### 6.3 Ex-post effects

Drawing from our previous discussion in sub-section 5.3, we estimate the ex-post effects of outward FDI through propensity score matching techniques.<sup>27</sup> As a first step, we estimate a probit model for the treatments *first investment abroad* (*START\_FDI*), *first investment in Asia* (*START\_FDI\_ASIA*), and *first investment in rest of the world* (*START\_FDI\_ROW*). Results are reported in Appendix A.

As a second step, we proceed by estimating the ATTs.<sup>28</sup> For consistency, we alternatively consider three different treatments, that is, *START\_FDI*, *START\_FDI\_ASIA*, and *START\_FDI\_ROW*.

Table 7 and Table 8 display the ATTs estimated with the kernel matching and radius matching methods, respectively.

[Insert Tables 7 and 8]

The kernel matching and radius matching methods deliver very consistent results. As for the treatment *START\_FDI*, the estimated ATTs are always positive and statistically significant. Large differences in performance after outward FDI arise when considering sales, profits and intangible assets; smaller, but still positive ex-post effects emerge for labour productivity. This evidence suggests that a learning mechanism is at play in our sample, consistent with previous results on Chinese firms reported by Huang and Zhang (2017), Chen and Tang (2014), Cozza et al. (2015), and Edamura et al. (2014). Compared with these papers, our work considers the most recent years and treat self-selection and learning effects in a more comprehensive framework.

As for the treatment *START\_FDI\_ASIA* and *START\_FDI\_ROW*, our evidence in Tables 7 and 8 suggests that the ex-post effects of outward FDI vary by destination. We find that undertaking outward FDI in Asia delivers greater returns than undertaking outward FDI in the rest of the world, the latter being nevertheless positive. This highlights that physical and cultural distance can partially compromise the efficiency gains Chinese firms enjoy from investing abroad. This effect is absent in Cozza et al. (2015) and Edamura et al. (2014), since they restrict attention to Chinese outward FDI to Europe. With this approach, they are unable to control for heterogeneous hosts.

Lastly, to evaluate the quality of our matching we test the so-called balancing hypothesis before and after the matching, testing whether the observations with the same propensity score have the same distribution of observable characteristics independent of the treatment. Moreover, we also test balancing properties for every variable used in the propensity score. Results, reported in Appendix B, confirm that the two groups are well balanced.

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<sup>27</sup> Preliminary OLS estimates of Equations 5 and 6 are available from the authors upon request.

<sup>28</sup> Our propensity score specification is consistent with Cozza et al. (2015) and Huang and Zhang (2017).

## 7. Conclusion

In this study, we investigate the relationship between performance and the decision by Chinese enterprises to invest abroad. Using firm-level panel data over the period 2008–2014, we are able to observe a firm's performance before and after its first investment abroad and thus rigorously assess the ex-ante and ex-post effects of outward FDI for Chinese firms. Moreover, our data allow us to identify investments by destination and thus evaluate whether the ex-ante and ex-post effects of outward FDI are heterogeneous with respect to the host country.

Our results contribute to the empirical literature on the relationship between outward FDI and firm-level performance and offer some elements for policy considerations.

In line with the existing literature, we detect a positive correlation between outward FDI and several measures of performance for Chinese firms. New to the literature is our evidence that the magnitude of the correlation varies across destinations.

To the best of our knowledge, our study is the first to examine rigorously self-selection by Chinese enterprises into outward FDI. Our estimates detect significant differences in performance between future outward FDI starters and future non-starters. This suggests that Chinese firms self-select into investing abroad, even if they do not appear to self-select into specific destinations.

Controlling for endogeneity through propensity score matching techniques, we show that outward FDI positively affects performance of Chinese companies and that the ex-post effects tend to be larger when investing in closer regions. Our analysis provides fresh evidence of the ex-post effects of Chinese outward FDI over a recent period, not covered by previous studies (Huang and Zhang 2017; Chen and Tang 2014; Cozza et al. 2015; Edamura et al. 2014), and involving a major overhaul of Chinese inward and outward FDI policy.

Our results provide some elements for policy considerations, as the causal interpretation of a positive correlation between firm performance and outward FDI has relevant policy implications (Mayer and Ottaviano 2007). If outward FDI has positive ex-post effects, promoting firm investment abroad may significantly contribute to a country's development. In the past, and certainly more forcefully since the adoption of the 12th Five Year Plan in 2010, Chinese authorities' interventions have steered the course of foreign direct investment in expectation of benefitting from the ex-post effects of outward FDI. Our evidence suggests that such policies have paid off. If firms investing abroad are ex-ante different from non-investing firms, policy measures aimed at promoting firm-level productivity are likely to result in improved internationalization. The supply-side structural reforms recently undertaken by the Chinese authorities are precisely designed to improve firm performance, potentially deploying the ex-ante effects of outward FDI. Our evidence suggests that such policies will pay off.

To conclude, joint consideration of the ex-ante and ex-post effects of outward FDI detected for Chinese enterprises suggests that the interplay between them is worth further investigation and may provide valuable policy prescriptions.

#### **Data Availability Statement**

The data that support the findings of this study are available from Bureau van Dijk. Restrictions apply to the availability of these data, which were used under license for this study. The authors do not have permission to share the data.



## References

- Amighini A, Rabellotti R, Sanfilippo M (2013) Do Chinese state-owned and private enterprises differ in their internationalization strategies? *China Economic Review* 27: 312-325
- Andreff W (2015) Outward foreign direct investment from BRIC countries: Comparing strategies of Brazilian, Russian, Indian and Chinese Multinational Companies. *European Journal of Comparative Economics* 12: 79-131
- Antras P, Helpman E (2004) Global sourcing. *Journal of Political Economy* 112: 552-580
- Antras P, Helpman E (2008) Contractual frictions and global sourcing. In: Helpman E, Marin D, Verdier T (eds) *The Organization of Firms in a Global Economy*. Harvard University Press, Cambridge, p 9-54
- Arnold JM, Hussinger K (2010) Exports versus FDI in German Manufacturing: Firm Performance and Participation in International Markets. *Review of International Economics* 18: 595-606
- Aw BJ, Lee Y (2008) Firm heterogeneity and location choice for Taiwanese multinationals. *Journal of International Economics* 75: 67-179
- Baldwin J, Gu W (2009) The impact of trade on plant scale, production-run length and diversification. In: Dunne T, Jensen JB, Roberts MJ (eds) *Producer Dynamics: New Evidence from Micro Data*. University of Chicago Press, Chicago, p 557-592
- Barba Navaretti G, Castellani D (2004) Investments abroad and performance at home: Evidence from Italian multinationals. *CEPR Discussion Papers* 4284
- Barba Navaretti G, Castellani D (2008) Do Italian firms improve their performance at home by investing abroad?. In: Brakman S, Garretsen H (eds) *Foreign Direct Investment and the Multinational Enterprise*. MIT Press, Cambridge MA
- Barba Navaretti G, Castellani D, Disdier AC (2010) How does investing in cheap labour countries affect performance at home? Firm-level evidence from France and Italy. *Oxford Economic Papers* 62: 234-260
- Becker S and Ichino A (2002) Estimation of Treatment Effects Based on Propensity Score. *The Stata Journal* 2: 358-377
- Benfratello L, Razzolini T (2009) Firms' productivity and internationalisation choices: evidence from a large sample of Italian firms. In: Piscitello L, Santangelo G (eds) *Multinationals and Local Competitiveness*. Franco Angeli, Milano, p 15-39
- Bernard AB, Jensen JB (1995) Exporters, jobs and wages in US manufacturing: 1976-1987. *Brookings Papers on Economic Activity, Microeconomics*: 67-119
- Borin A, Mancini M (2016) Foreign direct investment and firm performance: An empirical analysis of Italian firms. *Review of World Economics* 152: 705-732
- Bugamelli M, Cipollone P, Infante L (2000) L'internazionalizzazione delle imprese italiane negli anni novanta. *Rivista Italiana degli Economisti* 3: 349-386

- Bugamelli M, Cipollone P, Infante L (2001) Le imprese italiane all'estero: una valutazione quantitativa per strategia di accesso. In Quintieri B (ed) *Le imprese esportatrici italiane: caratteristiche, performance e internazionalizzazione*. Il Mulino, Bologna
- Caliendo M and Hujer R (2006) The Microeconometric Estimation of Treatment Effects. An Overview. *Allgemeines Statistisches Archiv* 90: 197-2012
- Caliendo M and Kopeinig S (2008) Some Practical Guidance for the Implementation of the Propensity Score Matching. *Journal of Economic Surveys* 22: 31-72
- Casaburi L, Gattai V, Minerva GA (2007) Firms' international status and heterogeneity in performance: Evidence from Italy. *Rivista di Politica Economica* 97: 151-187
- Castellani D (2002) Firms' technological trajectories and the creation of foreign subsidiaries. *International Review of Applied Economics* 16: 359-371
- Castellani D, Zanfei A (2007) Internationalisation, innovation and productivity: How do firms differ in Italy?. *The World Economy* 30: 156-176
- Castellani D, Mariotti I, Piscitello L (2008) The impact of outward investments on parent company's employment and skill composition. Evidence from the Italian case. *Structural Change and Economic Dynamics* 19: 81-94
- Castellani D, Giovannetti G (2010) Productivity and the international firm: Dissecting heterogeneity. *Journal of Economic Policy Reform* 13: 25-42
- Clerides SK, Lach S, Tybout JR (1998) Is learning by exporting important? Micro-dynamic evidence from Colombia, Mexico and Morocco. *Quarterly Journal of Economics* 113: 903-947
- Chari A, Chen W, Dominguez KME (2012) Foreign ownership and firm performance: Emerging acquisitions in the United States. *IMF Economic Review* 60: 1-42
- Chen W, Tang H (2014) The dragon is flying west: Micro-level evidence of Chinese outward direct investment. *Asian Development Review* 31: 109-140
- Cozza C, Rabellotti R, Sanfilippo M (2015) The impact of outward FDI on the performance of Chinese firms. *China Economic Review* 36: 42-57
- Dai X, Sun Z, Liu H (2018) Disentangling the effects of endogenous export and innovation on the performance of Chinese manufacturing. *China Economic Review* 40: 42-58
- Damijan JP, Polanec S, Prasnikar J (2007) Outward FDI and productivity: Micro-evidence from Slovenia. *World Economy* 30: 135-155
- Davies K (2013) Outward FDI from China and its policy context, 2012. In: Sauvart KP, Mallampally P, McAllister G (eds) *Inward and Outward FDI Country Profiles*. 2nd edn. Vale Columbia Center on Sustainable International Investment, New York, p 755-768
- De Loecker J (2007) Do exports generate higher productivity? Evidence from Slovenia. *Journal of International Economics* 73: 69-98

- Deng P (2013) Chinese outward direct investment research: Theoretical integration and recommendations. *Management and Organization Review* 9: 513-539
- Dollar D (2017) United States-China two-way direct investment: Opportunities and challenges. *Journal of Asian Economics* 50: 14-26
- Dunning JH (1981) Explaining the International Direct Investment Position of Countries: Towards a Dynamic or Development Approach. *Weltwirtschaftliches Archiv* 119: 30-64
- Dunning JH, Narula R (1998) The investment development path revisited: Some emerging issues. In: Dunning JH, Narula R (eds) *Foreign Direct Investment and Governments. Catalysts for Economic Restructuring*. Routledge, London, p 1-41
- Edamura K, Haneda S, Inui T et al (2014) Impact of Chinese cross-border outbound M&As on firm performance: Econometric analysis using firm-level data. *China Economic Review* 30: 169-179
- Engel D, Procher V (2012) Export, FDI and firm productivity. *Applied Economics* 44: 1931-1940
- Federico S (2010) Outsourcing versus integration at home or abroad and firm heterogeneity. *Empirica* 37: 47-63
- Garcia-Herrero A, Xia L, Casanova C (2015) Chinese outbound foreign direct investment: How much goes where after round-tripping and offshoring?. BBVA WP 15/17 June
- Gattai V, Natale P (2016) New Facts about BRIC Multinationals: From Macro to Micro Evidence. In Van Tulder R., Verbeke AR., Carneiro J, onzaes-Perez MA (eds) *The Challenge of/for BRIC Multinationals*. Emerald, p 61-92
- Gattai V, Mechelli R, Natale P (2018) ODI from BRIC Countries: Firm-level Evidence. Palgrave Macmillan, Basingstoke
- Gattai V, Mechelli R, Natale P (2019) Some Twins are not Alike: FDI Premia in the Former Soviet States. *International Journal of Emerging Markets* 14: 451-474.
- Gattai V, Sali G (2018) FDI direction, FDI margin, and heterogeneous firms: Evidence from the EU. *International Review of Applied Economics* 32: 283-307
- Girma S, Gorg H, Strobl E. (2004) Exports, international investment, and plant performance: Evidence from a non-parametric test. *Economics Letters* 83: 317-324
- Girma S (2005) Technology transfer from acquisition FDI and the absorptive capacity of domestic firms: An empirical investigation. *Open Economies Review* 16: 175-187
- Greenaway D, Kneller R (2007) Firm heterogeneity, exporting and foreign direct investment: A Survey. *The Economic Journal* 117: F134-F161
- Grossman SJ, Helpman E, Szeidl A (2006) Optimal integration strategies for the multinational firm. *Journal of International Economics* 70: 216-238

- Grossman GM, Rossi-Hansberg E (2008) Trading tasks: A simple theory of offshoring. *American Economic Review* 98: 1978-1997
- Hayakawa K, Kimura F, Machikita T (2012) Globalization and productivity: a survey of firm-level analysis. *Journal of Economic Surveys* 26: 332-350
- Head K, Ries J (2003) Heterogeneity and the foreign direct investment versus exports decision of Japanese manufacturers. *Journal of the Japanese and International Economics* 17: 448-467
- Helpman E, Melitz M, Yeaple S (2004) Export versus FDI. *American Economic Review* 94: 300-316
- Hijzen A, Inui T, Todo Y (2010) Does offshoring pay? Firm-level evidence from Japan. *Economic Inquiry* 48: 880-895
- Hijzen A, Jean S, Mayer T (2011) The effects at home of initiating production abroad: evidence from matched French firms. *Review of World Economics* 147: 457-483
- Huang Y, Zhang Y (2017) How does outward foreign direct investment enhance firm productivity? A heterogeneous empirical analysis from Chinese manufacturing. *China Economic Review* 44: 1-15
- Imbens GW and Wooldridge JM (2009) Recent Developments in the Econometrics of Program Evaluation. *Journal of Economic Literature* 47: 5-86
- IMF (1993) Balance of Payments Manual, 5th edn. IMF, Washington, DC
- Ito Y (2007) Choice for FDI and post-FDI productivity. RIETI Discussion Paper E049
- Kalemli-Ozcan S, Sorensen BE, Villegas-Sanchez C et al (2015) How to construct nationally representative firm level data from the ORBIS global database. CEPR Discussion Papers 10829
- Kimura F, Kiyota K (2006) Exports, FDI, and productivity: dynamic evidence from Japanese firms. *Review of World Economics* 142: 695-719
- Kohler WK, Smolka M (2011) Sourcing premia with incomplete contracts: Theory and evidence. *The B.E. Journal of Economics Analysis and Policy* 11: 1-39
- Kohler WK, Smolka M. (2012) Global sourcing decisions and firm productivity: Evidence from Spain. In Stern RM (ed) *Quantitative Analysis of Newly Evolving Patterns of International Trade: Fragmentation; Offshoring of Activities; and Vertical Intra-Industry Trade*. World Scientific Publishing, Singapore, p 139-189
- Kolstad I, Wiig A (2012) What determines Chinese outward FDI? *Journal of World Business* 47: 26–34
- Levi M, Li K, Zhang F (2014) Director gender and mergers and acquisitions. *Journal of Corporate Finance* 28: 185-200
- Levinsohn J, Petrin A (2003) Estimating Production Functions Using Inputs to Control for Unobservables. *Review of Economic Studies* 70: 317-342

- Leuven E, Sianesi B (2003) PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing. Software, <http://ideas.repec.org/c/boc/bocode/s432001.html>
- Lopez RA (2005) Trade and growth: Reconciling the macroeconomic and microeconomic evidence. *Journal of Economic Surveys* 19: 623-648
- Mayer T, Ottaviano GIP (2007) The happy few: The internationalisation of European firms. Bruegel Blueprint Series 3, Bruegel, Brussels
- Melitz MJ (2003) The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica* 71: 1695-1725
- Murakami Y (2005) Are multinational enterprises more productive? A test of the selection hypothesis. *Journal of Asian Economics* 16: 327-339
- Piermartini R, Rousová L (2013) The sky is not flat: How discriminatory is the access to International Air Services? *American Economic Journal: Economic Policy* 3: 287-319
- OECD (1996) OECD Benchmark Definition of Foreign Direct Investment, 3rd edn. OECD, Paris
- Quer D, Claver E, Rienda L (2011) Political risk, cultural distance, and outward foreign direct investment: Empirical evidence from large Chinese firms. *Asia Pacific Journal of Management*: 1-16
- Raff H, Ryan M, Stahler F (2012) Firm productivity and the foreign-market entry decision. *Journal of Economics and Management Strategy* 21: 849-871
- Ramamurti R (2012) What is really different about emerging market multinationals?. *Global Strategy Journal* 2: 41-47
- Ramasamy B, Yeung M, Laforet S (2012) China's outward foreign direct investment: Location choice and firm ownership. *Journal of World Business* 47: 17–25
- Ribeiro SP, Menghinello S, Backer KD (2010). The OECD ORBIS database: Responding to the need for firm-level micro-data in the OECD. *OECD Statistics Working Papers*: 2010/1
- Redding SJ (2011) Theories of heterogeneous firms and trade. *Annual Review of Economics* 3: 77-105
- Sauvant KP (2016) China, the G20 and the International Investment Regime. *China & World Economy* 24: 73-92
- Sauvant KP, Chen VZ (2014) China's regulatory framework for outward foreign direct investment. *China Economic Journal* 7: 141-163
- Sauvant KP, Nolan MD (2015) China's Outward Foreign Direct Investment and International Investment Law. *Journal of International Economic Law* 18: 893-934
- Singh T (2010) Does international trade cause economic growth? A Survey. *The World Economy* 33: 1517-1564

- Song L, Yang J, Zhang Y (2011) State-owned enterprises' outward investment and the structural reform in China. *China & the World Economy* 19: 38–53
- Sutherland D, Ning L (2011) Exploring 'onward-journey' ODI strategies in China's private sector businesses. *Journal of Chinese Economic and Business Studies* 9: 43–65
- The Economist (2013) The second wave. 26<sup>th</sup> October
- The Economist (2015) Gone shopping. 28<sup>th</sup> March
- The Economist Intelligence Unit (2017) China Going Global Investment Index 2017, [www.eiu.com](http://www.eiu.com)
- Tomiura E (2007) Global sourcing, technology, and factor intensity: Firm-level relationships. RIETI Discussion Paper Series 24
- UNCTAD (2001) World Investment Report 2018. Promoting Linkages. United Nations, Geneva
- UNCTAD (2018) World Investment Report 2018. Investment and New Industrial Policies. United Nations, Geneva
- UNCTAD (2019) World Investment Report 2019. Special Economic Zones. United Nations, Geneva
- UNCTAD (2020) World Investment Report 2020. International Production Beyond the Pandemic. United Nations, Geneva
- Van Biesebroeck J (2005) Exporting raises productivity in sub-Saharan African manufacturing firms. *Journal of International Economics* 67: 373-391
- Wagner J (2006) Export, foreign direct investment, and productivity: Evidence from German firm level data. *Applied Economics Letters* 13: 347-349
- Wagner J (2007) Exports and productivity: A Survey of the evidence from firm-level data. *The World Economy* 30: 60-72
- Wagner J (2012) International trade and firm performance: A Survey of empirical studies since 2006. *Review of World Economics* 148: 235-267
- Wagner J (2016) A survey of empirical studies using transaction level data on exports and imports. *Review of World Economics* 152: 215-225
- Wei S, Xie Z, Zhang X (2017) From "made in China" to "innovated in China": Necessity, prospect, and challenges. *Journal of Economic Perspectives* 31: 49-70
- Yang S, Chen K, Huang T (2013) Outward foreign direct investment and technical efficiency: Evidence from Taiwan's manufacturing firms. *Journal of Asian Economics* 27: 7-17

## Appendix A

To deal with the potential endogeneity of the explanatory variables, we estimate the ex-post effects of outward FDI by means of a propensity score matching procedure. The first step in the procedure is to estimate the probability that a firm invests for the first time at  $t$  conditional on firm characteristics as observed at  $t - 1$ , the so-called propensity score. We estimate the propensity score by means of a probit model for the treatments *first investment abroad* ( $START\_FDI$ ), *first investment in Asia* ( $START\_FDI\_ASIA$ ), and *first investment in rest of the world* ( $START\_FDI\_ROW$ ).

Results are reported below.

[Insert Tables A.1]

## Appendix B

The propensity score matching procedure rests on the match of *treated* and *control* firms. To evaluate the quality of our matching, we test the so-called balancing hypothesis before and after matching, testing whether the observations with the same propensity score have the same distribution of observable characteristics independent of the treatment.

Tables B.1 and B.2 show that the t-tests computed on the *treated* group are not statistically different from zero, the mean and the median biases generally decrease, and the pseudo- $R^2$  (not reported) exhibits the expected reduction after matching.

Tables B.3 and B.4 report the results from testing balancing properties for every variable used in the propensity score and confirm that the two groups are well balanced.

[Insert Tables B.1, B.2, B.3 and B.4]



## Tables

*Table 1: Outward FDI flows and stocks, billion USD and percentage, selected years*

Region/economy	1995	2005	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
<b><i>Outward FDI flows</i></b>												
World	361	833	1396	1627	1305	1421	1367	1708	1543	1601	986	1314
China	2	12	69	75	88	108	123	146	196	158	143	117
China as % World	0.6	1.5	4.9	4.6	6.7	7.6	9.0	8.5	12.7	9.9	14.5	8.9
<b><i>Outward FDI stocks</i></b>												
World	3993	11909	20465	20919	22836	25181	26314	26575	28102	33041	31508	34571
China	18	57	317	425	532	660	883	1098	1357	1809	1982	2099
China as % World	0.4	0.5	1.5	2.0	2.3	2.6	3.4	4.1	4.8	5.5	6.3	6.1

*Source: Authors' elaborations from UNCTAD (2020) data*

Table 2: Description of firm-level variables

Variable	Description
<i>du_age</i>	Dummy variable; 1 if the age of firm is no larger than the sample mean age.
<i>du_FDI</i>	Dummy variable; 1 if the firm has at least one subsidiary abroad, 0 otherwise.
<i>du_FDI_ASIA</i>	Dummy variable; 1 if the firm has at least one subsidiary in Asia, 0 if the firm has no subsidiary abroad.
<i>du_FDI_ROW</i>	Dummy variable; 1 if the firm has at least one subsidiary in the rest of the world (defined w.r.t. Asia), 0 if the firm has no subsidiary abroad.
<i>du_START_FDI</i>	Dummy variable; 1 if the firm had no subsidiary abroad in the years $t-2$ and $t-1$ and has at least one in year $t$ ; 0 if the firm has no subsidiary abroad in the years $t-2$ , $t-1$ and $t$ .
<i>du_START_FDI_ASIA</i>	Dummy variable; 1 if the firm had no subsidiary abroad in the years $t-2$ and $t-1$ and has at least one in Asia in year $t$ ; 0 if the firm has no subsidiary abroad in the years $t-2$ , $t-1$ and $t$ .
<i>du_START_FDI_ROW</i>	Dummy variable; 1 if the firm had no subsidiary abroad in the years $t-2$ and $t-1$ and has at least one in the rest of the world (defined w.r.t. Asia) in year $t$ ; 0 if the firm has no subsidiary abroad in the years $t-2$ , $t-1$ and $t$ .
<i>sales</i>	Firm's sales (USD).
<i>profit</i>	Firm's profit (USD).
<i>n</i>	Firm's number of employees.
<i>lp</i>	Labour productivity, defined as $sales/n$ .
<i>ia</i>	Firm's intangible assets (USD).
<i>ta</i>	Firm's tangible assets (mln USD).
<i>k</i>	Firm's capital (mln USD).
<i>k/n</i>	capital intensity (mln USD).
<i>rd</i>	Firm's R&D expenditure (mln USD).
<i>age</i>	Firm's age, defined as the difference between year $t$ and the year of foundation (hundreds).
<i>Large</i>	Dummy variable; 1 if the firm has a number of employees larger than the sample mean, 0 otherwise.
<i>Public</i>	Dummy variable; 1 if the firm is State-owned, 0 otherwise.

Table 3: Basic correlations. OLS estimates of Equation 1

	(1)	(2)	(3)	(4)
	<i>sales</i>	<i>profit</i>	<i>lp</i>	<i>ia</i>
<i>du_FDI</i>	1.08*** (0.08)	1.06*** (0.07)	0.16*** (0.06)	0.89*** (0.09)
<i>age</i>	-1.39*** (0.37)	-0.95*** (0.36)	1.03*** (0.29)	-0.10 (0.44)
<i>public</i>	0.53*** (0.06)	0.60*** (0.06)	-0.45*** (0.05)	0.36*** (0.08)
<i>large</i>	1.96*** (0.06)	1.87*** (0.05)	-1.26*** (0.04)	1.46*** (0.07)
province dummies	yes	yes	yes	yes
industry dummies	yes	yes	yes	yes
year dummies	yes	yes	yes	yes
Observations	3,885	3,890	3,869	3,729
R-squared	0.44	0.43	0.28	0.33

Standard errors in parentheses

A \*, \*\* and \*\*\* denote significance at the 10, 5 and 1 per cent levels

All the dependent variables are transformed into natural logarithms

Table 4: Basic correlations by destination of outward FDI. OLS estimates of Equation 2

	(1)	(2)	(3)	(4)
	<i>sales</i>	<i>profit</i>	<i>lp</i>	<i>ia</i>
<i>du_FDI_Asia</i>	0.62*** (0.10)	0.50*** (0.10)	0.07 (0.08)	0.40*** (0.13)
<i>Du_FDI_RoW</i>	0.99*** (0.08)	1.04*** (0.08)	0.18*** (0.07)	0.90*** (0.10)
<i>age</i>	-1.31*** (0.37)	-0.89** (0.36)	1.04*** (0.29)	-0.05 (0.44)
<i>public</i>	0.55*** (0.06)	0.61*** (0.06)	-0.45*** (0.05)	0.38*** (0.08)
<i>large</i>	1.94*** (0.06)	1.85*** (0.05)	-1.26*** (0.04)	1.44*** (0.07)
province dummies	yes	yes	yes	yes
industry dummies	yes	yes	yes	yes
year dummies	yes	yes	yes	yes
Observations	3,885	3,890	3,869	3,729
R-squared	0.44	0.43	0.28	0.34

Standard errors in parentheses

A \*, \*\* and \*\*\* denote significance at the 10, 5 and 1 per cent levels

All the dependent variables are transformed into natural logarithms

Table 5: Ex-ante effects. OLS estimates of Equation 3

	(1)	(2)	(3)	(4)
	<i>sales</i>	<i>profit</i>	<i>lp</i>	<i>ia</i>
<i>du_START_FDI</i>	0.72***	0.65***	0.58***	0.54***
	(0.15)	(0.16)	(0.12)	(0.19)
<i>age</i>	-0.98**	-0.19	-0.42	1.07*
	(0.48)	(0.50)	(0.37)	(0.61)
<i>public</i>	0.75***	0.92***	0.46***	0.59***
	(0.09)	(0.09)	(0.07)	(0.12)
<i>large</i>	1.79***	1.72***	-0.26***	1.31***
	(0.07)	(0.08)	(0.06)	(0.09)
province dummies	yes	yes	yes	yes
industry dummies	yes	yes	yes	yes
year dummies	yes	yes	yes	yes
Observations	1,887	1,900	1,856	1,812
R-squared	0.39	0.36	0.16	0.28

Standard errors in parentheses

A \*, \*\* and \*\*\* denote significance at the 10, 5 and 1 per cent levels

All the dependent variables are transformed into natural logarithms

Table 6: Ex-ante effects by destination of outward FDI. OLS estimates of Equation 4

	(1)	(2)	(3)	(4)
	<i>sales</i>	<i>profit</i>	<i>lp</i>	<i>ia</i>
<i>du_START_FDI_ASIA</i>	0.60***	0.47***	0.44***	0.19
	(0.16)	(0.16)	(0.12)	(0.21)
<i>du_START_FDI_ROW</i>	0.52***	0.48***	0.55***	0.54**
	(0.17)	(0.18)	(0.13)	(0.22)
<i>age</i>	-0.94**	-0.16	-0.40	1.09*
	(0.48)	(0.50)	(0.37)	(0.61)
<i>public</i>	0.77***	0.93***	0.47***	0.60***
	(0.09)	(0.09)	(0.07)	(0.12)
<i>large</i>	1.78***	1.72***	-0.27***	1.31***
	(0.07)	(0.08)	(0.06)	(0.10)
province dummies	yes	yes	yes	yes
industry dummies	yes	yes	yes	yes
year dummies	yes	yes	yes	yes
Observations	1,887	1,900	1,856	1,812
R-squared	0.39	0.36	0.16	0.28

Standard errors in parentheses

A \*, \*\* and \*\*\* denote significance at the 10, 5 and 1 per cent levels

All the dependent variables are transformed into natural logarithms

Table 7: Average treatment effects on treated (treatment *START\_FDI*, *START\_FDI\_ASIA* and *START\_FDI\_ROW*) – Kernel matching method

	(1)	(2)	(3)	(4)
	<i>sales</i>	<i>profit</i>	<i>lp</i>	<i>ia</i>
<i>du_start_FDI</i>	0.8724*** (0.2349)	0.8216*** (0.2053)	0.3640** (0.1524)	0.9395*** (0.2655)
Treated	52	51	52	49
Control	1,084	1,093	1,078	1,043
<i>du_START_FDI_ASIA</i>	1.6356*** (0.4509)	1.2350** (0.4991)	0.6009* (0.2927)	1.7661*** (0.5078)
Treated	16	15	16	15
Control	1,120	1,129	1,114	1,077
<i>du_START_FDI_ROW</i>	0.9599*** (0.2531)	1.0979*** (0.2061)	0.2242 (0.1497)	1.1547*** (0.2995)
Treated	42	41	42	40
Control	1,094	1,103	1,088	1,052

Standard errors in parentheses

A \*, \*\* and \*\*\* denote significance at the 10, 5 and 1 per cent levels

All the dependent variables are transformed into natural logarithms.

Table 8: Average treatment effects on treated (treatment *START\_FDI*, *START\_FDI\_ASIA* and *START\_FDI\_ROW*) – Radius matching method

	(1)	(2)	(3)	(4)
	<i>sales</i>	<i>profit</i>	<i>lp</i>	<i>ia</i>
<i>du_start_FDI</i>	0.6791*** (0.2591)	0.5182** (0.2174)	0.4499*** (0.1759)	0.7676** (0.3111)
Treated	52	51	52	49
Control	1,084	1,093	1,078	1,043
<i>du_START_FDI_ASIA</i>	1.5455*** (0.4815)	0.8678 (0.5272)	0.6216* (0.3325)	1.5824*** (0.5602)
Treated	16	15	16	15
Control	1,120	1,129	1,114	1,077
<i>du_START_FDI_ROW</i>	0.6065** (0.2774)	0.6472*** (0.2214)	0.2092 (0.1684)	0.6575* (0.3345)
Treated	42	41	42	40
Control	1,094	1,103	1,088	1,052

Standard errors in parentheses

A \*, \*\* and \*\*\* denote significance at the 10, 5 and 1 per cent levels

All the dependent variables are transformed into natural logarithms

## Appendix A

*Table A.1: Probit model treatment START\_FDI, START\_FDI\_ASIA and START\_ROW*

	<i>START FDI</i>	<i>START FDI ASIA</i>	<i>START FDI ROW</i>
<i>Lagged k/n</i>	0.17** (0.07)	0.18 (0.11)	0.17** (0.08)
<i>Lagged n</i>	0.31*** (0.06)	0.31*** (0.09)	0.29*** (0.06)
<i>du_age</i>	-0.07 (0.14)	-0.02 (0.21)	-0.10 (0.15)
<i>Province dummies</i>	Yes	Yes	Yes
<i>Industry dummies</i>	Yes	Yes	Yes
<i>Constant</i>	-4.84*** (0.71)	-5.46*** (1.07)	-4.62*** (0.75)
<i>Observations</i>	1,169	1,169	1,169

Standard errors in parentheses

A \*, \*\* and \*\*\* denote significance at the 10, 5 and 1 per cent levels

## Appendix B

*Table B.1: Balancing test of propensity score matching (treatment  $START\_FDI$ ,  $START\_FDI\_ASIA$  and  $START\_FDI\_ROW$ ) - kernel matching method*

	$R^2$	$X^2$	$p > X^2$	Mean Bias	Median Bias	R-stat
<i>Dependent variable: sales</i>						
$START\_FDI$						
Unmatched	0.07	31.39***	0.00	24.40	21.20	1.10
Matched	0.01	1.91	0.86	6.70	3.60	0.93
$START\_FDI\_ASIA$						
Unmatched	0.09	15.71**	0.01	32.10	21.80	1.23
Matched	0.06	2.64	0.76	18.30	10.10	0.77
$START\_FDI\_ROW$						
Unmatched	0.06	23.00***	0.00	22.40	9.40	1.16
Matched	0.03	3.16	0.68	8.50	2.00	0.85
<i>Dependent variable: profit</i>						
$START\_FDI$						
Unmatched	0.07	31.39***	0.00	24.40	21.20	1.10
Matched	0.02	2.06	0.84	7.90	5.50	0.90
$START\_FDI\_ASIA$						
Unmatched	0.09	15.71**	0.01	32.10	21.80	1.23
Matched	0.07	2.90	0.72	23.80	18.00	0.78
$START\_FDI\_ROW$						
Unmatched	0.06	23.00***	0.00	22.40	9.40	1.16
Matched	0.03	3.52	0.62	9.30	1.10	0.82
<i>Dependent variable: lp</i>						
$START\_FDI$						
Unmatched	0.07	31.39***	0.00	24.40	21.20	1.10
Matched	0.01	1.85	0.87	6.60	3.40	0.94
$START\_FDI\_ASIA$						
Unmatched	0.09	15.71***	0.01	32.10	21.80	1.23
Matched	0.06	2.57	0.77	18.00	9.90	0.77
$START\_FDI\_ROW$						
Unmatched	0.06	23.00***	0.00	22.40	9.40	1.16
Matched	0.03	3.08	0.69	8.40	2.20	0.85
<i>Dependent variable: ia</i>						
$START\_FDI$						
Unmatched	0.07	31.39***	0.00	24.40	21.20	1.10
Matched	0.01	1.88	0.87	6.60	3.00	0.93
$START\_FDI\_ASIA$						
Unmatched	0.09	15.71**	0.01	32.10	21.80	1.23
Matched	0.08	3.27	0.66	22.20	12.90	0.71
$START\_FDI\_ROW$						
Unmatched	0.06	23.00***	0.00	22.40	9.40	1.16
Matched	0.03	2.84	0.73	8.30	4.00	0.85

\*, \*\* and \*\*\* denote significance at the 10, 5 and 1 per cent levels



Table B.2: Balancing test of propensity score matching (treatment *START\_FDI*, *START\_FDI\_ASIA* and *START\_FDI\_ROW*) - radius matching method

	$R^2$	$X^2$	$p > X^2$	Mean Bias	Median Bias	R-stat
<i>Dependent variable: sales</i>						
<i>START_FDI</i>						
Unmatched	0.07	31.39***	0.00	24.40	21.20	1.10
Matched	0.00	0.23	1.00	3.30	2.30	0.93
<i>START_FDI_ASIA</i>						
Unmatched	0.09	15.71***	0.01	32.10	21.80	1.23
Matched	0.00	0.18	1.00	5.20	5.40	0.75
<i>START_FDI_ROW</i>						
Unmatched	0.06	23.00***	0.00	22.40	9.40	1.16
Matched	0.00	0.44	0.99	6.20	6.90	1.02
<i>Dependent variable: profit</i>						
<i>START_FDI</i>						
Unmatched	0.07	31.39***	0.00	24.40	21.20	1.10
Matched	0.01	1.30	0.94	8.20	6.10	1.03
<i>START_FDI_ASIA</i>						
Unmatched	0.09	15.71***	0.01	32.10	21.80	1.23
Matched	0.01	0.41	1.00	8.30	6.10	1.78
<i>START_FDI_ROW</i>						
Unmatched	0.06	23.00***	0.00	22.40	9.40	1.16
Matched	0.01	0.66	0.99	7.10	6.70	1.03
<i>Dependent variable: lp</i>						
<i>START_FDI</i>						
Unmatched	0.07	31.39***	0.00	24.40	21.20	1.10
Matched	0.00	0.41	1.00	4.30	3.60	1.10
<i>START_FDI_ASIA</i>						
Unmatched	0.09	15.71***	0.01	32.10	21.80	1.23
Matched	0.00	0.19	1.00	5.30	5.50	0.75
<i>START_FDI_ROW</i>						
Unmatched	0.06	23.00***	0.00	22.40	9.40	1.16
Matched	0.01	0.56	0.99	6.30	7.40	1.38
<i>Dependent variable: ia</i>						
<i>START_FDI</i>						
Unmatched	0.07	31.39***	0.00	24.40	21.20	1.10
Matched	0.01	0.79	0.98	6.20	3.40	0.80
<i>START_FDI_ASIA</i>						
Unmatched	0.09	15.71***	0.01	32.10	21.80	1.23
Matched	0.00	0.13	1.00	3.60	2.30	0.73
<i>START_FDI_ROW</i>						
Unmatched	0.06	23.00***	0.00	22.40	9.40	1.16
Matched	0.00	0.28	1.00	4.80	3.50	1.29

\*, \*\* and \*\*\* denote significance at the 10, 5 and 1 per cent levels

*Table B.3: Balancing test of propensity score matching (treatment *START\_FDI*, *START\_FDI\_ASIA* and *START\_FDI\_ROW*) by variable  
kernel matching method*

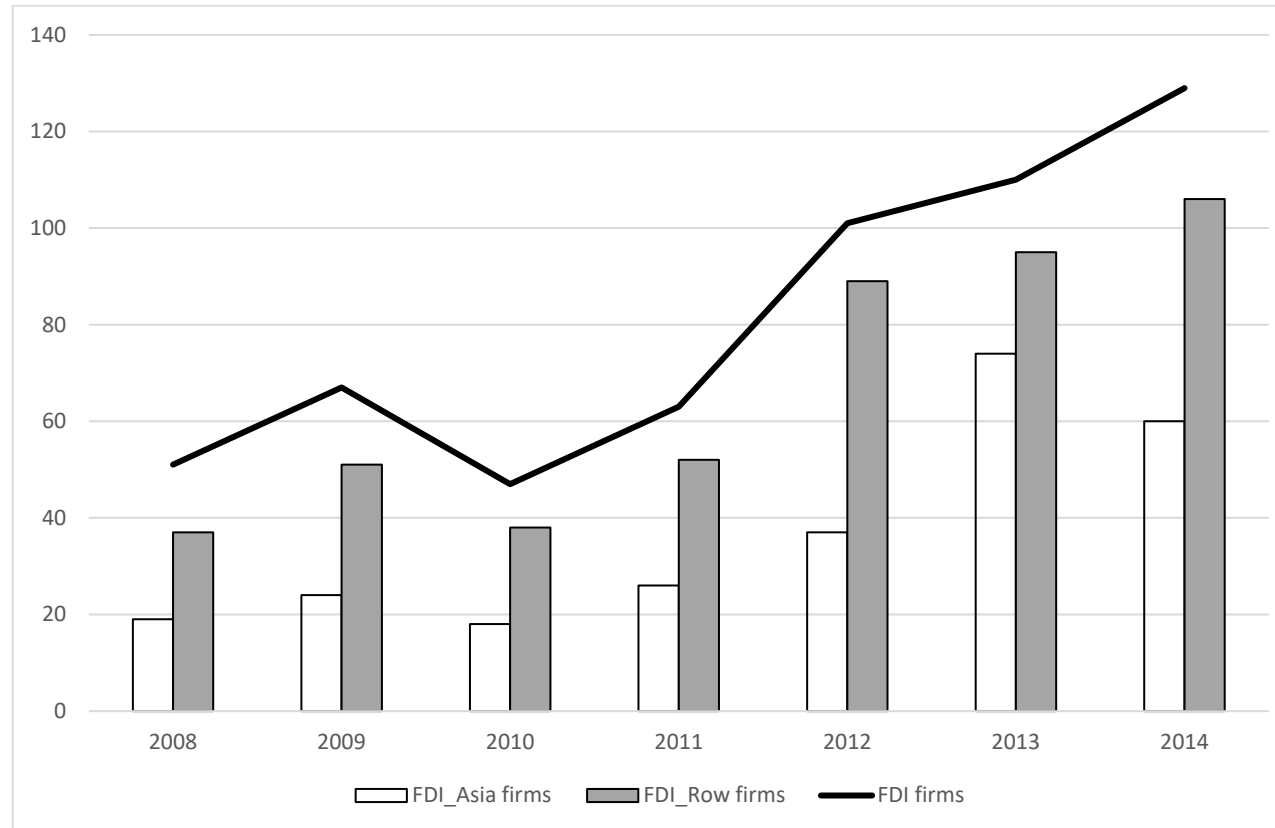
	<i>Dependent variable: sales</i>			<i>Dependent variable: profit</i>			<i>Dependent variable: lp</i>			<i>Dependent variable: ia</i>		
	<b>Bias (%)</b>	<b>Reduction in bias</b>	<b>Variance ratio</b>	<b>Bias (%)</b>	<b>Reduction in bias</b>	<b>Variance ratio</b>	<b>Bias (%)</b>	<b>Reduction in bias</b>	<b>Variance ratio</b>	<b>Bias (%)</b>	<b>Reduction in bias</b>	<b>Variance ratio</b>
<i>START_FDI</i>												
<i>Lagged k/n</i>	U	-22,40		0,81	U	-22,40		0,81	U	-22,40		0,81
	M	-3,60	83,90	0,97	M	-5,50	75,20	0,97	M	-3,40	84,60	1,00
<i>Lagged n</i>	U	70,40		0,69	U	70,40		0,69	U	70,40		0,69
	M	22,00	68,80	0,80	M	23,90	66,00	0,78	M	21,60	69,40	0,80
<i>du_age</i>	U	-7,20		0,99	U	-7,20		0,99	U	-7,20		0,99
	M	1,40	80,80	0,98	M	2,10	71,50	0,97	M	1,50	78,60	0,97
<i>Province dummies</i>	U	21,20		1,29	U	21,20		1,29	U	21,20		1,29
	M	5,80	72,60	1,06	M	5,70	73,30	1,05	M	5,80	72,70	1,06
<i>Industry dummies</i>	U	0,80		0,95	U	0,80		0,95	U	0,80		0,95
	M	0,80	4,50	1,01	M	2,10	-152,80	1,02	M	0,70	14,20	1,01
<i>START_FDI_ASIA</i>												
<i>Lagged k/n</i>	U	-21,80		0,91	U	-21,80		0,91	U	-21,80		0,91
	M	-10,10	53,70	1,03	M	-18,00	17,40	1,09	M	-9,90	54,50	1,02
<i>Lagged n</i>	U	83,10		0,61	U	83,10		0,61	U	83,10		0,61
	M	48,90	41,10	0,61	M	55,20	33,50	0,84	M	48,30	41,90	0,61
<i>du_age</i>	U	-1,90		1,04	U	-1,90		1,04	U	-1,90		1,04
	M	-1,50	21,70	0,99	M	0,40	77,80	1,00	M	-1,30	29,50	0,99
<i>Province dummies</i>	U	38,30		1,89	U	38,30		1,89	U	38,30		1,89
	M	24,60	35,80	1,34	M	30,00	21,60	1,27	M	24,50	36,10	1,34
<i>Industry dummies</i>	U	15,40		0,94	U	15,40		0,94	U	15,40		0,94
	M	6,30	59,40	0,91	M	15,40	-0,10	0,74	M	6,00	60,90	0,91
<i>START_FDI_ROW</i>												
<i>Lagged k/n</i>	U	-18,80		0,76	U	-18,80		0,76	U	-18,80		0,76
	M	-5,50	70,60	0,95	M	-8,80	53,20	0,96	M	-5,50	71,00	0,95
<i>Lagged n</i>	U	67,40		0,72	U	67,40		0,72	U	67,40		0,72
	M	32,10	52,40	0,82	M	35,50	47,40	0,79	M	31,70	53,00	0,82
<i>du_age</i>	U	-9,40		1,00	U	-9,40		1,00	U	-9,40		1,00
	M	-1,70	81,50	1,01	M	-1,00	89,10	1,00	M	-1,70	81,90	1,01
<i>Province dummies</i>	U	7,20		0,89	U	7,20		0,89	U	7,20		0,89
	M	-1,10	84,80	0,98	M	-1,10	84,40	0,97	M	-0,90	87,60	0,98
<i>Industry dummies</i>	U	-9,20		0,86	U	-9,20		0,86	U	-9,20		0,86
	M	-2,00	78,10	0,96	M	0,10	99,40	0,99	M	-2,20	75,60	0,96
	M	-4,00	56,30	0,94								

*Table B.4: Balancing test of propensity score matching (treatment *START\_FDI*, *START\_FDI\_ASIA* and *radius matching method*)*

	<i>Dependent variable: sales</i>				<i>Dependent variable: profit</i>				<i>Dependent variable: lp</i>			
	<b>Bias (%)</b>	<b>Reduction in bias</b>	<b>Variance ratio</b>		<b>Bias (%)</b>	<b>Reduction in bias</b>	<b>Variance ratio</b>		<b>Bias (%)</b>	<b>Reduction in bias</b>	<b>Variance ratio</b>	
<i>START_FDI</i>												
<i>Lagged k/n</i>	U	-22,40		0,81	U	-22,40		0,81	U	-22,40		
	M	1,20	94,50	0,82	M	15,30	31,50	0,72	M	3,60	84,00	
<i>Lagged n</i>	U	70,40		0,69	U	70,40		0,69	U	70,40		
	M	1,00	98,60	0,82	M	-3,10	95,60	0,79	M	-0,70	99,10	
<i>du_age</i>	U	-7,20		0,99	U	-7,20		0,99	U	-7,20		
	M	-2,30	67,70	1,00	M	-2,40	66,30	1,02	M	-5,10	28,80	
<i>Province dummies</i>	U	21,20		1,29	U	21,20		1,29	U	21,20		
	M	-4,30	79,60	1,12	M	-13,80	34,70	1,03	M	-2,10	90,10	
<i>Industry dummies</i>	U	0,80		0,95	U	0,80		0,95	U	0,80		
	M	-7,40	-784,50	1,11	M	-6,10	-626,50	1,05	M	-9,80	-1070,90	
<i>START_FDI_ASIA</i>												
<i>Lagged k/n</i>	U	-21,80		0,91	U	-21,80		0,91	U	-21,80		
	M	-3,20	85,10	1,15	M	5,50	74,80	0,94	M	-3,10	85,70	
<i>Lagged n</i>	U	83,10		0,61	U	83,10		0,61	U	83,10		
	M	11,60	86,00	0,66	M	6,10	92,70	0,62	M	11,70	85,90	
<i>du_age</i>	U	-1,90		1,04	U	-1,90		1,04	U	-1,90		
	M	5,80	-206,40	0,90	M	-5,20	-173,00	0,91	M	5,50	-193,60	
<i>Province dummies</i>	U	38,30		1,89	U	38,30		1,89	U	38,30		
	M	0,00	99,90	0,99	M	-18,10	52,70	1,13	M	-0,40	99,00	
<i>Industry dummies</i>	U	15,40		0,94	U	15,40		0,94	U	15,40		
	M	5,40	65,10	0,94	M	6,60	57,20	0,91	M	5,50	64,40	
<i>START_FDI_ROW</i>												
<i>Lagged k/n</i>	U	-18,80		0,76	U	-18,80		0,76	U	-18,80		
	M	-8,10	56,80	1,31	M	11,80	37,20	0,86	M	-2,00	89,30	
<i>Lagged n</i>	U	67,40		0,72	U	67,40		0,72	U	67,40		
	M	5,20	92,30	0,81	M	-6,70	90,10	0,93	M	2,70	96,00	
<i>du_age</i>	U	-9,40		1,00	U	-9,40		1,00	U	-9,40		
	M	6,90	27,00	0,91	M	-13,00	-38,40	1,11	M	11,70	-24,60	
<i>Province dummies</i>	U	7,20		0,89	U	7,20		0,89	U	7,20		
	M	7,90	-10,10	1,09	M	1,90	74,10	1,04	M	7,40	-3,30	
<i>Industry dummies</i>	U	-9,20		0,86	U	-9,20		0,86	U	-9,20		
	M	-2,80	69,40	1,01	M	-2,00	78,60	1,01	M	-7,70	16,00	

## Figures

*Figure 1: Involvement in outward FDI by sample Chinese firms*



*Source: Authors' elaborations from Orbis (2017)*